

Amendments to the Specification

Please replace paragraph [0007] with the following rewritten paragraph.

[0007] The first and most important method of protection from nerve agents is to prevent exposure. For military personnel and other first responders, masks and full body protective gear are available, but this equipment has certain drawbacks. Impermeable suits and even some air permeable suits are bulky and hot. The equipment inhibits free movement and tasks are harder and take longer to complete. In addition to those factors, hard physical work in these suits this may cause heat stress or even collapse. There may also be long delays before decontamination can be completed so the protective gear must be worn for long periods. This makes for a marginally acceptable first defense against a chemical warfare agent attack. Decontamination is also time-consuming so the equipment must often be destroyed and new equipment provided. It is also difficult to provide everyone with such protective equipment in the general population, and the effectiveness of such equipment diminishes during use. Tasks requiring detailed work using fingers and hands such as keystrokes on a keyboard, or pushing buttons on phones or equipment can be severely hampered by such bulky protective gear.

Please replace paragraph [0009] with the following rewritten paragraph.

[0009] Historically, most approaches to chemical agent decontamination have focused on the treatment of surfaces after chemical exposure, whether real or merely suspected, has occurred. There are several current methods of decontamination of surfaces. One method is post-exposure washing with hot water with or without addition of detergents or organic solvents, such as caustic solutions (e.g., DS2, bleach) or foams (e.g., Eco, Sandia, Decon Green). Additional types of methods are include an application of use of intensive heat and carbon dioxide applied for sustained periods, and incorporation of oxidizing materials (e.g., TiO₂ and porphyrins) into coatings that, when exposed to sustained high levels of UV light, degrade chemical agents (Buchanan, J. H. et al., 1989; Fox, M. A., 1983). Chemical agent resistant coatings (“CARCs”) have been developed to withstand repeated decontamination efforts with such caustic and organic solvents. However, the resulting “decontaminated” materials are often still contaminated. Moreover, many decontamination

procedures aerosolize contaminants on surfaces to be cleaned. In addition, it is often hard to clean certain kinds of surfaces such as those with rough texture, or with deep crevasses and other hard to reach areas that must often “self-decontaminate.”

Please replace paragraph [0010] with the following rewritten paragraph.

[0010] Although each of these approaches can be effective under specific conditions, a number of additional limitations exist. Caustic solutions degrade surfaces, create personnel handling and environmental risks, and require transport and mixing logistics. Additionally, alkaline solutions, such as a bleaching agent, ~~is~~are both relatively slow in chemically degrading VX OPs and can produce decontamination products nearly as toxic as the OP itself (Yang, Y.-C. et al., 1990). While foams may have both non-specific biocidal and chemical decontamination properties, they require transport and mixing logistics, may have personnel handling and environmental risks, and are not effective on sensitive electronic equipment or interior spaces. CARCs have been shown to become porous after sustained UV light exposure that can create a sponge effect that may actually trap chemical agents and delay decontamination. Moreover, these approaches are not well suited for decontamination of convoluted surfaces. Decontamination with heat and carbon dioxide presents logistical requirements and does not allow rapid reclamation of equipment. UV-based approaches can be costly and have logistical requirements, including access to UV-generating equipment and power, as well as the production of toxic byproducts of degradation (Yang, Y.-C. et al., 1992; Buchanan, J. H. et al., 1989; Fox, M. A., 1983).

Please replace paragraph [0017] with the following rewritten paragraph.

[0017] U.S. Patent Publication No. US 2002/0106361 A1 discusses a marine anti-fungal enzyme for use in a marine coating. However, the substrate for the enzyme was incorporated into the marine coating, and the enzyme was in a marine environment as the organism from which it was obtained. Immobilized enzymes in ~~an~~a latex are discussed in the April, 2002 edition of “Emulsion Polymer Technologies,” by the Paint Research Association-website <http://www.pra.org.uk/publications/emulsion/emulsion-highlights-2002.htm>.

Please replace paragraph [0020] with the following rewritten paragraph.

[0020] The present invention provides compositions and methods capable of effective decontamination of OP compounds, as well as ~~prophylactic~~prophylactic protection of buildings, equipment, and ~~personel~~personnel that contact such objects, from OP compounds, including CWAs. As they relate to detoxification of OPs, the compositions and methods disclosed herein differ substantially from prior efforts, which focus on enzymatic detoxification of chemical compounds by application of a decontamination composition or method to the site of contamination after contact with the chemical compound. The preferred embodiments of the present invention represent a paradigm shift in chemical decontamination. They demonstrate usable compositions and methods for prophylactic protection of a site prior to contact with a chemical by prior application of a protective coating comprising an enzyme composition of the present invention. While prophylactic treatment with the coatings of the invention ~~are~~is a preferred embodiment, such a coating can also be used to coat a surface after contamination occurs. A preferred coating comprises a paint. Specifically, a paint comprising a preferred enzyme composition of the present invention degrades an organophosphorus compound, including a chemical warfare agent, into a significantly less toxic compound. ~~Another~~Other preferred ~~coating~~coatings ~~comprises~~comprise a clear coat, a textile treatment, a wax, elastomer, or a sealant.

Please replace paragraph [0025] with the following rewritten paragraph.

[0025] In general embodiments, a biomolecule of the present invention refers to a compound comprising one or more chemical moieties normally produced by a living organism such as an amino acid, a nucleic acid, a sugar, a lipid, or a combination thereof. The invention provides a coating comprising a biomolecule composition, wherein the biomolecule composition comprises an active biomolecule. A biomolecule typically has a function in or upon a living organism, such as binding another molecule, catalyzing a chemical reaction, or a combination thereof. Specific examples of such activity by a biomolecule include an antibody binding an antigen, a cell receptor binding a ligand, an enzyme binding a substrate, a transport protein ~~may~~bindbinding a ligand, *etc.* In some aspects, binding a ligand may be a desired activity such as, for example, to sequester an undesired molecule, such as a toxin, to the biomolecule. Often, a

biomolecule's activity further comprises a specific chemical reaction in addition to a physical/chemical affinity for another molecule. For example, an enzyme may accelerate a chemical reaction upon the bound substrate, a cell receptor may change conformation and/or become enzymatically active or inactive toward a second substrate, a transport protein may mitigate the movement of a molecule, *etc.* In another example, a biomolecule may comprise a ligand that induces or inhibits such activity in an enzyme, a cell receptor, a transport protein, and the like.

Please replace paragraph [0114] with the following rewritten paragraph.

[0114] In addition to the sources described herein for biomolecules, reagents, living cells, *etc.*, one of ordinary skill in the art may obtain such materials and/or chemical formulas thereof for use in the present invention from a convenient source such as a public database, a biological depository, and/or a commercial vendor. For example, various nucleotide sequences, including those that encode amino acid sequences, may be obtained at a public database, such as the Entrez Nucleotides database found at: <http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=Nucleotide>, which includes sequences from other databases including GenBank, RefSeq, and PDB. In another example, various amino acid sequences may be obtained at a public database, such as the Entrez databank found at: <http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=Protein>, which includes sequences from other databases including SwissProt, PIR, PRF, PDB, GenBank, and RefSeq. ~~Additional examples of such databases are listed at:~~ <http://www.rcsb.org/pdb/links.html#Databases>, and numerous Numerous nucleic acid sequences and/or encoded amino acid sequences can be obtained from such sources. In a further example, biological materials that comprise, or are capable of comprising such biomolecules (including living cells), may be obtained from a depository such as the American Type Culture Collection ("ATCC"), P.O. Box 1549 Manassas, VA 20108, USA. In an additional example, biomolecules, chemical reagents, biological materials, and equipment may be obtained, as is well known to those of ordinary skill in the art, from commercial vendors such as Amersham Biosciences®, 800 Centennial Avenue, P.O. Box 1327, Piscataway, NJ 08855-1327 USA; BD Biosciences®, including Clontech®, Discovery Labware®, Immunocytometry Systems® and Pharmingen®, 1020 East Meadow Circle, Palo Alto, CA 94303-4230 USA; Invitrogen™, 1600 Faraday Avenue, PO

Box 6482, Carlsbad, California 92008 USA; New England Biolabs[®], 32 Tozer Road, Beverly, MA 01915-5599 USA; Merck[®], One Merck Drive, P.O. Box 100, Whitehouse Station, NJ 08889-0100 USA; Novagene[®], 441 Charmany Dr., Madison, WI 53719-1234 USA; Promega[®], 2800 Woods Hollow Road, Madison WI 53711 USA; Pfizer[®], including Pharmacia[®], 235 East 42nd Street, New York, NY 10017 USA; Quiagen[®], 28159 Avenue Stanford, Valencia, CA 91355 USA; Sigma-Aldrich[®], including Sigma, Aldrich, Fluka, Supelco and Sigma-Aldrich Fine Chemicals, PO Box 14508, Saint Louis, MO 63178 USA; Stratagene[®], 11011 N. Torrey Pines Road, La Jolla, CA 92037 USA, *etc.*

Please replace paragraph [0121] with the following rewritten paragraph.

[0121] In some embodiments, enzymes may be described by the classification system of The International Union of Biochemistry and Molecular Biology ("IUBMB"). The IUBMB classifies enzymes by the type of reaction catalyzed and enumerates each sub-class by a designated enzyme commission number ("EC"). ~~The IUBMB classification of various enzymes may be obtained using the computerized database at <http://www.chem.qmw.ac.uk/iubmb/enzyme/>.~~ Based on these broad categories, an enzyme may comprise an oxidoreductase (EC 1), a transferase (EC 2), a hydrolase (EC 3), a lyase (EC 4), an isomerase (EC 5), a ligase (EC 6), or a combination thereof. Often, an enzyme may be able to catalyze multiple reactions, and thus have multiple EC classifications.

Please replace paragraph [0123] with the following rewritten paragraph.

[0123] An oxidoreductase catalyzes an oxido-reduction of a substrate, wherein the substrate is either a hydrogen donor and/or an electron donor. An oxidoreductase is generally classified by the substrate moiety that is the donor or acceptor. Examples of oxidoreductases include an oxidoreductase that acts on a donor CH-OH moiety, (EC 1.1); an donor aldehyde or a donor oxo moiety, (EC 1.2); a donor CH-CH moiety, (EC 1.3); a donor CH-NH₂ moiety, (EC 1.4); a donor CH-NH moiety, (EC 1.5); a donor nicotinamide adenine dinucleotide ("NADH") or a donor nicotinamide adenine dinucleotide phosphate ("NADPH"), (EC 1.6); a donor nitrogenous compound, (EC 1.7); a donor sulfur moiety, (EC 1.8); a donor heme moiety, (EC 1.9); a donor

diphenol or a related moiety as donor, (EC 1.10); a peroxide as an acceptor, (EC 1.11); a donor hydrogen, (EC 1.12); a single donor with incorporation of molecular oxygen (“oxygenase”), (EC 1.13); a paired donor, with incorporation or reduction of molecular oxygen, (EC 1.14); a superoxide radical as an acceptor, (EC 1.15); an oxidoreductase that oxidises a metal ion, (EC 1.16); an oxidoreductase that acts on a donor CH₂ moiety, (EC 1.17); a donor iron-sulfur protein, (EC 1.18); a donor reduced flavodoxin, (EC 1.19); a donor phosphorus or donor arsenic moiety, (EC 1.20); an oxidoreductase that acts on an X-H and an Y-H to form an X-Y bond, (EC 1.21); as well as a other oxidoreductase, (EC 1.97)~~[Is this the right number?]~~; or a combination thereof.

Please replace paragraph [0124] with the following rewritten paragraph.

[0124] A transferase catalyzes the transfer of a moiety from a donor compound to an acceptor compound. A transferase is generally classified based on the chemical moiety transferred.

Examples of transferases include ~~an a~~ transferase that catalyzes the transfer of a one-carbon moiety, (EC 2.1); an aldehyde or a ketonic moiety, (EC 2.2); an acyl moiety, (EC 2.3); a glycosyl moiety, (EC 2.4); an alkyl or an aryl moiety other than a methyl moiety, (EC 2.5); a nitrogenous moiety, (EC 2.6); a phosphorus-containing moiety, (EC 2.7); a sulfur-containing moiety, (EC 2.8); a selenium-containing moiety, (EC 2.9); or a combination thereof.

Please replace paragraph [0154] with the following rewritten paragraph.

[0154] It is possible to optimize a proteinaceous molecule with a defined amino acid sequence and/or length for one or more properties. An alteration in a desirable property is possible because such molecules can be manipulated, for example, by chemical modification, as described herein or as would be known to one of ordinary skill in the art, in light of the present disclosures. As used herein “alter” or “alteration” may result in an increase or a decrease in the measured value for a particular property. As used herein a “property,” in the context of an proteinaceous molecule, includes, but is not limited to, a ligand binding property, a catalytic property, a stability property, a property related to environmental safety, or a combination thereof. Examples of a catalytic property that may be altered include a kinetic parameter, such as K_m, a catalytic rate (k_{cat}) for a substrate, an enzyme’s specificity for a substrate (k_{cat}/K_m), or a

combination thereof. Examples of a stability property that may be altered include thermal stability, half-life of activity, stability after exposure to a weathering condition, or a combination thereof. Examples of a property related to environmental safety include an alteration in toxicity, antigenicity, bio-degradability, or a combination thereof. However, as would be readily apparent to one of ordinary skill in the art, an alteration to increase an enzyme's catalytic rate for a substrate, an enzyme's specificity for a substrate, a proteinaceous molecule's thermal stability, a proteinaceous molecule's half-life of activity, or a proteinaceous molecule's stability after exposure to a weathering condition may be preferred for some applications, while a decrease in toxicity and/or antigenicity for a proteinaceous molecule may be preferred in additional applications. An enzyme comprising a chemical modification that ~~function~~ functions as an enzyme of the present invention is a "functional equivalent" to, and "in accordance" with, an unmodified enzyme.

Please replace paragraph [0161] with the following rewritten paragraph.

[0161] In an additional example, the secondary, tertiary and/or quaternary structure of a proteinaceous molecule may be modeled using techniques known in the art, including X-ray crystallography, nuclear magnetic resonance, computer based modeling, or a combination thereof to aid in the identification of active-site, binding site, and other residues for the design and production of a mutant form of an enzyme (Bugg, C. E. et al., 1993; Cohen, A. A. and Shatzmiller, S. E., 1993; Hruby, V. J., 1993; Moore, G. J., 1994; Dean, P. M., 1994; Wiley, R. A. and Rich, D. H., 1993). The secondary, tertiary and/or quaternary structures of a proteinaceous molecule may be directly determined by techniques such as X-ray crystallography and/or nuclear magnetic resonance to identify amino acids most likely to affect one or more desirable properties. Additionally, many primary, secondary, tertiary, and/or quaternary structures of proteinaceous molecules can be obtained using a public computerized database. An example of such a databank that may be used for this purpose is the Protein Data Bank (PDB), which is an international repository of the 3-dimensional structures of many biological macromolecules, ~~and can be accessed at~~ <http://www.rcsb.org/pdb/index.html>. ~~Additional examples of such databases are listed at:~~ <http://www.rcsb.org/pdb/links.html#Databases>.

Please replace paragraph [0163] with the following rewritten paragraph.

[0163] In embodiments wherein an amino acid of particular interest ~~have~~has been identified using such techniques, functional equivalents may be created using mutations that substitute a different amino acid for the identified amino acid of interest. Examples of substitutions of an amino acid side chain to produce a “functional equivalent” proteinaceous molecule are also known in the art, and may involve a conservative side chain substitution a non-conservative side chain substitution, or a combination thereof, to rationally alter a property of a proteinaceous molecule. Examples of conservative side chain substitutions include, when applicable, replacing an amino acid side chain with one similar in charge (*e.g.*, an arginine, a histidine, a lysine); similar in hydrophobic index; similar in hydrophilicity; similar in hydrophobicity; similar in shape (*e.g.*, a phenylalanine, a tryptophan, a tyrosine); similar in size (*e.g.*, an alanine, a glycine, a serine); similar in chemical type (*e.g.*, acidic side chains, aromatic side chains, basic side chains); or a combination thereof. Conversely, when a change to produce a non-conservative substitution is contemplated to alter a property of proteinaceous molecule, and still produce a “functional equivalent” proteinaceous molecule, these guidelines can be used to select an amino acid whose side-chains relatively non-similar in charge, hydrophobic index, hydrophilicity, hydrophobicity, shape, size, chemical type, or a combination thereof. Various amino acids have been given a numeric quantity based on the characteristics of charge and hydrophobicity, called the hydrophobic index (Kyte, J. and Doolittle, R. F. 1982), which can be used as a criterion for a substitution. The hydrophobic index of the common amino acids are: Arg (-4.5); Lys (-3.9); Asn (-3.5); Asp (-3.5); Gln (-3.5); Glu (-3.5); His (-3.2); Pro (-1.6); Tyr (-1.3); Trp (-0.9); Ser (-0.8); Thr (-0.7); Gly (-0.4); Ala (+1.8); Met (+1.9); Cys (+2.5); Phe (+2.8); Leu (+3.8); Val (+4.2); and Ile (+4.5). Additionally, a value has also been given to various amino acids based on hydrophilicity, which can also be used as a criterion for substitution (U.S. Pat. No. 4,554,101). The hydrophilicity values for the common amino acids are: Trp (-3.4); Phe (-2.5); Tyr (-2.3); Ile (-1.8); Leu (-1.8); Val (-1.5); Met (-1.3); Cys (-1.0); Ala (-0.5); His (-0.5); Pro (-0.5+/-0.1); Thr (-0.4); Gly (0); Asn (+0.2); Gln (+0.2); Ser (+0.3); Asp (+3.0+/-0.1); Glu (+3.0+/-0.1); Arg (+3.0); and Lys (+3.0). In aspects wherein an amino acid is being conservatively substituted for an amino acid whose hydrophobic index or hydrophilic value is similar, the difference between the respective index and/or value is preferably within +/- 2, more preferably within +/- 1, and

most preferably within ± 0.5 . In aspects wherein an amino acid is being non-conservatively substituted for an amino acid whose hydrophobic index or hydrophilic value is similar, the difference between the respective index and/or value is preferably greater than ± 0.5 , more preferably greater than ± 1 , and most preferably greater than ± 2 .

Please replace paragraph [0274] with the following rewritten paragraph.

[0274] In other alternative embodiments, a coating may undergo film formation, but produce a film whose properties makes it more suited for a temporary use. Such a temporary film will generally possess a poor and/or low rating for a property that would confer longevity in use. For example, a film with a poor scrub resistance, a poor solvent resistance, a poor water resistance, a poor weathering property (*e.g.*, UV resistance), a poor adhesion property, or a combination thereof, may be selected as a temporary film. In one aspect, a film may have poor adhesion for a surface, allowing ease of removal by stripping and/or peeling. In another example, a film may have a poor resistance to an environmental factor, and subsequently fail (*e.g.*, crack, peel, chalk, *etc.*) to remain a viable film upon the surface. For example, a film that undergoes chalking is specifically contemplated. Chalking is the erosion a coating, typically by degradation of the binder due to various environmental forces (*e.g.*, UV irradiation). It is contemplated that in some embodiments, chalking may be desirable, to ~~expose~~ remove a contaminant from the surface of a film and/or expose a component of the film (*e.g.*, a biomolecular composition of the present invention) to the surface of the coating. A self-cleaning coating is a film with a desirable chalking property. It is further contemplated that in many aspects the layer of non-film forming coating, a temporary film and/or a self-cleaning film may be removed from a surface with ease. In such embodiments, a non-film forming coating, a temporary film, a self-cleaning film, or a combination thereof would be more suitable for a temporary use upon a surface, due to the ability to be applied as a layer and easily removed when its presence is no longer desired. In these embodiments, it is contemplated that the non-film forming coating, the temporary film, the self-cleaning film, or a combination thereof, is desired for a use upon a surface that lasts a temporary period of time, such as, for example, 1 to 60 seconds, 1 to 24 hours, 1 to 7 days, 1 to 10 weeks, 1 to 6 months, including all intermediate ranges and combinations thereof, respectively.

Please replace paragraph [0275] with the following rewritten paragraph.

[0275] In some embodiments, a plurality of coating layers, known herein as a “multicoat system” (“multicoating system”), may be applied upon a surface. The coating selected for use in a specific layer may differ from an additional layer of the multicoat system. This selection of coatings with differing components and/or properties is typically done to sequentially confer, in a desired pattern, the properties of differing coatings to a coated surface and/or multicoat system. Examples of a coating that may be selected for use, either alone or in a multicoat system, include a sealer, a water repellent, a primer, an undercoat, a topcoat, or a combination thereof. A sealer is coating applied to a surface to reduce or prevent absorption by the surface of a subsequent coating layer and/or a coating component thereof, and/or to prevent damage to the subsequent coating layer by the surface. A water repellent is a coating applied to a surface to repel water. A primer is a coating that is applied to increase adhesion between the surface and a subsequent layer. In typical embodiments a primer-coating, a sealer-coating, a water repellent-coating, or a combination thereof is applied to porous surface. Examples of a porous surface include drywall, wood, plaster, masonry, damaged and/or degraded film, corroded metal, or a combination thereof. In certain aspects, the porous surface is not coated or lacks a film prior to application of a primer, sealer, water repellent, or combination thereof. An undercoat is a coating applied to a surface to provide a smooth surface for a subsequent coat. A topcoat (“finish”) is a coating applied to a surface for a protective and/or decorative purpose. Of course, a sealer, water repellent, primer, undercoat, and/or topcoat may possess additional protective, decorative, and/or functional properties. Additionally, the surface a sealer, water repellent, primer, undercoat, and/or topcoat are applied to may be a coated surface such as a coating and/or film of a layer of the a multicoat system. In certain embodiments, a multicoat system may comprise any combination of a sealer, water repellent, primer, undercoat, and/or topcoat. For example, a multicoat system may comprise any of the following combinations: a sealer, a primer and a topcoat; a primer and topcoat; a water repellent, a primer, undercoat, and topcoat; an undercoat and topcoat; a sealer, an undercoat, and a topcoat; a sealer and topcoat; a water repellent and topcoat, *etc.* In particular aspects, a coating layer may comprise properties that would be a combination of those associated with different coating types such as a sealer, water repellent, primer, undercoat, and/or topcoat. In such instances, such a combination coating

and/or film is designated by a backslash "/" separating the individual coating designations encompassed by the layer. Examples of such a coating layer comprising a plurality of functions include a sealer/primer coating, a sealer/primer/undercoat coating, a sealer/undercoat coating, a primer/undercoat coating, a water repellent/primer coating, an undercoat/topcoat coating, a primer/topcoat coating, a primer/undercoat/topcoat coating, *etc.* In embodiments wherein the coated surface comprises a particular type of coating, then the coated surface may be known herein by the type of coating such as a "painted surface," a "clear coated surface," a "lacquered surface," a "varnished surface," a "water repellent/primered surface," an "primer/undercoat-topcoated surface," *etc.*

Please replace paragraph [0284] with the following rewritten paragraph.

[0284] A stain is a clear or semitransparent coating formulated to change the color of surface. In general embodiments, a stain is a wood-coating designed to color or protect a wood surface but not conceal the grain pattern or texture. A stain comprises a binder such as an oil, an alkyd, or a combination thereof. Often a stain comprises a low solid content. A low solids content for a wood stain is less than 20% volume of solids. The low solid content of a stain promotes the ability of the coating to penetrate the material of the wooden surface. This property is often used to, for example, to promote the incorporation of a fungicide that may be comprised within the stain into the wood. In certain alternative aspects, a stain comprises a high solids content stain, wherein the solid content is 20% or greater, may be used on a surface to produce a film possessing the property of little or no flaking. In other alternative aspects, a water-borne stain may be used such as a stain comprising a water-borne alkyd. A stain typically further comprises a liquid component (*e.g.*, a solvent), a fungicide, a pigment, or a combination thereof. In other aspects, a stain comprises a water repellent hydrophobic compound so it functions as a water repellent-coating ("stain/water repellent-coating"). Examples of a water repellent hydrophobic compound a stain may comprise include a silicone oil, a wax, or a combination thereof. Examples of a fungicide include a copper soap, a zinc soap, or a combination thereof. Examples of a pigment include a pigment that is similar in color to wood. Examples of such pigments include a red pigment (*e.g.*, a red iron oxide) a yellow pigment (*e.g.*, a yellow iron oxide), or a combination thereof. Standards procedures for testing a stain's (*e.g.*, an exterior stain)

properties, are described in, for example, in “ASTM Book of Standards, Volume 06.02, Paint -- Products and Applications; Protective Coatings; Pipeline Coatings,” D6763-02, 2002.

Please replace paragraph [0304] with the following rewritten paragraph.

[0304] Automotive coatings refer to coatings used on automotive vehicles, particularly those for civilian use. The manufacturers of a vehicle typically require that a coating conform to specific properties of weatherability (*e.g.*, UV resistance) and/or appearance. Typically, an automotive coating comprises a multicoat system. In specific embodiments, an automotive ~~multicoat~~ multicoat system comprises a primer, a topcoat, or a combination thereof. Examples of an automotive primer include a nonweatherable primer, which lack sufficient UV resistance for single layer use, or a weatherable primer, which possesses sufficient UV resistance to be used without an additional layer. Examples of a topcoat include an interior topcoat, an exterior topcoat, or a combination thereof.

Please replace paragraph [0308] with the following rewritten paragraph.

[0308] An exterior automotive topcoat is typically ~~is~~ applied to a metal surface, a plastic surface, or a combination thereof. In certain aspects, an exterior automotive topcoat is part of a multicoat system further comprising a primer, sealer, undercoat, or a combination thereof. In certain embodiments, an exterior automotive topcoat comprises a binder capable of thermosetting in combination with a melamine binder. Examples of such a thermosetting binder include an acrylic binder, an alkyd binder, a urethane binder, polyester binder, or a combination thereof. In certain embodiments, a melamine binder may be partly or fully replaced with an urethane binder, wherein the coating is a two-pack coating. In typical embodiments, an exterior automotive topcoat further comprises a light stabilizer, a UV absorber, or a combination thereof. In general aspects, an exterior automotive topcoat further comprises a pigment.

Please replace paragraph [0315] with the following rewritten paragraph.

[0315] It is contemplated that, in light of the present disclosures, a specification coating may be formulated by selection of coating components one of ordinary skill in the art to fulfill a set of requirements prescribed by a consumer. Examples a specification finish coating include a military specified coating, a Federal agency specified coating (e.g., Department of Transportation), a state specified coating, or a combination thereof. A specification coating such as a CARC, a camouflage coating, or a combination thereof would be preferred in certain embodiments for incorporation of a biomolecule composition of the present invention. A camouflage coating is a coating that is formulated with materials (e.g., pigments) that reduce the visible differences between the appearance of a coated surface from the surrounding ~~environment~~environment. Often, as would be known to one of ordinary skill in the art, a camouflage coating is formulated to reduce the detection of ~~an~~a coated surface by ~~device~~a device that measures nonvisible light (e.g., infrared radiation). Various sources of specification coating requirements are described in, for example, "Paint and Coating Testing Manual, Fourteenth Edition of the Gardner-Sward Handbook," (Koleske, J. V. Ed.), pp. 891-893, 1995).

Please replace paragraph [0317] with the following rewritten paragraph.

[0317] A traffic marker coating is a coating (e.g., a paint) used to very visibly ~~conveys~~convey information on a surface usually subjected to weathering and abrasion (e.g., a pavement). A traffic marker coating may be a solvent-borne coating or a water-borne coating. Examples of a solvent-borne traffic marker coating include an alkyd, a chlorinated rubber, or a combination thereof. In certain aspects, a solvent-borne coating is applied by spray application. In some embodiments, a traffic marker coating is a two-pack coating, such as, for example, an epoxy-coating, a polyester-coating, or a combination thereof. In other embodiments, a traffic marker coating comprises a thermoplastic coating, a thermosetting coating, or a combination thereof. Examples of a combination thermoplastic/thermosetting coating include a solvent-borne alkyd and/or solvent-borne chlorinated rubber-coating. Examples of a thermoplastic coating include a maleic-modified glycerol ester-coating, a hydrocarbon-coating, or a combination thereof. In

certain aspects, a thermoplastic coating comprises a liquid component, wherein the liquid component comprises a plasticizer, a pigment, and an additive (*e.g.*, a glass bead).

Please replace paragraph [0334] with the following rewritten paragraph.

[0334] An oil-based binder coating may be selected for embodiments wherein a relatively low viscosity is desired, such as, for example, application to a corroded metal surface, a porous surface (*e.g.*, wood), or a combination thereof, due to the penetration power of a low viscosity coating. In certain facets, it is preferred that application of an oil-binder coating produces a layer ~~is having~~ less than 25 μm on vertical surfaces and 40 μm on horizontal surfaces to reduce shrinkage, wrinkling. Additionally, in aspects wherein the profile of the wood surface is to be retained, ~~a~~ such a thin film thickness is preferred. In specific aspects, an oil-binder coating may be selected as a wood stains, a topcoat, or a combination thereof. In particular facets, a wood stain comprises an oil (*e.g.*, linseed oil) coating, an alkyd, or a combination thereof. Often, wood coating comprises a lightstabilizer (*e.g.*, UV absorber).

Please replace paragraph [0355] with the following rewritten paragraph.

[0355] An oleoresinous binder is a type of binder prepared from heating a resin and an oil. Examples of a resin typically used in the preparation of an oleoresinous binder include resins obtained from a biological source (*e.g.*, a wood resin, a bitumen resin); a fossil source (*e.g.*, copal resin, a Kauri gum resin, a rosin resin, a shellac resin); a synthetic source (*e.g.*, a rosin derivative resin, a phenolic resin, an epoxy resin); or a combination thereof. An example of an oil typically used in the preparation of an oleoresinous binder includes a vegetable oil, particularly an oil that is comprises a polyunsaturated fatty acid such as tung, linseed, or a combination thereof. The type of resin and oil used can identify an oleoresinous binder such as a copal-tung oleoresinous binder, a rosin-linseed oleoresinous binder, *etc.* An oleoresinous binder generally ~~are is~~ used in clear varnishes such as a lacquer, as well as in applications as a primer, an undercoat, a marine coating, or a combination thereof. In addition to the standards and analysis techniques previously described for an oil, standards for physical properties, chemical properties, and/or procedures for testing the purity/properties (*e.g.*, glass transition temperature, molecular weight, color stability) of a

hydrocarbon resin (*e.g.*, a synthetic source resin) for use in an oleoresinous binder or other coating component are described, for example, in “ASTM Book of Standards, Volume 06.03, Paint -- Pigments, Drying Oils, Polymers, Resins, Naval Stores, Cellulosic Esters, and Ink Vehicles,” E28-99, D6090-99, D6440-01, D6493-99, D6579-00, D6604-00, and D6605-00, 2002.

Please replace paragraph [0377] with the following rewritten paragraph.

[0377] In embodiments wherein an amino resin coating comprise an amino resin prepared from urea, the coating may be used as wood coating (*e.g.*, furniture coating), an industrial coating (*e.g.*, an appliance coating), an automotive primer, a clear coating, or a combination thereof. However, an amino resin film, wherein the resin was prepared from urea, generally produces a film with poor resistance to moisture, and is preferred as an internal coating and/or as part of a multicoat system. In certain embodiments, an amino resin prepared from melamine, generally produces films with good resistance to moisture, temperature, UV irradiation, or a combination thereof. A melamine-based amino coating may be applied to a metal surface. In specific aspects, such a melamine amino resin coating may be an automotive coating, a coil coating, a metal container coating, or a combination thereof. In embodiments wherein an amino resin coating ~~comprise~~ comprises an amino resin prepared from benzoguanamine, the film produced generally possesses poor weathering resistance, good corrosion resistance, water resistance, detergent resistance, flexibility, hardness, or a combination thereof. A benzoguanamine amino resin may be used as an industrial coating, particularly for indoor applications (*e.g.*, an appliance coating). In embodiments wherein an amino resin coating comprise an amino resin prepared from, glycoluril, a higher baking temperature and/or acid catalyst may be used during film formation, but less byproducts may be released. A glycoluril-based amino-coating typically produces a film with excellent corrosion resistance, humidity resistance, or a combination thereof. A glycoluril-based amino-coating may be selected as a metal coating.

Please replace paragraph [0379] with the following rewritten paragraph.

[0379] A urethane binder (“polyurethane binder,” “urethane,” “polyurethane”) is a binder ~~comprising~~ prepared from compounds that comprise an isocyanate moiety. The urethane binder’s urethane moiety can form intermolecular hydrogen bonds between urethane binder polymers, and these non-covalent bonds confer useful properties in a coating or film comprising ~~an a~~ urethane binder. The hydrogen bonds can be broken by mechanical stress, but will reform, thereby conferring a property of abrasion resistance. Additionally, a urethane binder can form some hydrogen bonds with water, conferring a plasticizing property to the coating. In certain embodiments, a urethane binder comprises an isocyanate moiety. The isocyanate moiety is highly reactive (*e.g.*, crosslinkable) with a moiety comprising a chemically reactive hydrogen. Examples of a chemically reactive hydrogen moiety include a hydroxyl moiety, an amine moiety, or a combination thereof. Examples of an additional binder include a polyol, an amine, an epoxide, silicone, vinyl, phenolic, or a combination thereof. In certain embodiments, a urethane coating is a thermosetting coating. In specific aspects, a urethane coating comprises a catalyst (*e.g.*, dibutyltin dilaurate, stannous octoate, zinc octoate). In specific facets, the coating comprises 10 to 100 parts per million catalyst, including all intermediate ranges and combinations thereof. In some embodiments, such a coating will undergo film formation at ambient conditions or slightly greater temperatures. A binder comprising an isocyanate moiety is often selected to produce a coating with durability in an external environment. A urethane coating typically possesses good flexibility, toughness, abrasion resistance, chemical resistance, water resistance, or a combination thereof. An aliphatic urethane coating may be selected for the additional property of good lightfastness.

Please replace paragraph [0386] with the following rewritten paragraph.

[0386] In alternative embodiments, a urethane temporary coating (*e.g.*, a non-film forming coating) may be produced, for example, by selection of a urethane resin that that comprises fewer or no crosslinkable moieties, selection of an addition binder that comprises fewer or no crosslinkable moieties, reducing the concentration of the a urethane resin and/or additional binder, using a bake cured ~~a~~ urethane resin coating at temperatures less than is needed for curing

(e.g., ambient conditions), selection of size range for a thermoplastic urethane resin coating that is less suitable for film formation (e.g., 1 kDa to 40 kDa), or a combination thereof.

Please replace paragraph [0387] with the following rewritten paragraph.

[0387] The previous discussion of urethane coatings ~~is~~ focused on solvent-borne urethane ~~coating~~ coatings. A water-borne urethane coating typically ~~is~~ comprises a water-dispersible urethane binder such as a cationic modified urethane binder and/or anionic modified urethane binder. A cationic modified urethane binder is a urethane binder chemically modified by ~~an~~ a diol comprising an amine, such as, for example, diethanolamine, methyl diethanolamine, *N,N*-bis(hydroxyethyl)- α -aminopyridine, lysine, *N*-hydroxyethylpiperidine, or a combination thereof. An anionic modified urethane binder is a urethane binder chemically modified by ~~an~~ a diol comprising a carboxylic acid such as dimethylolpropionic acid (2,2-bis(hydroxymethyl) propionic acid), dihydroxybenzoic acid, and/or a sulfonic acid (e.g., 2-hydroxymethyl-3-hydroxy-propanesulfonic acid), or a combination thereof.

Please replace paragraph [0390] with the following rewritten paragraph.

[0390] In alternative embodiments, a phenolic resin temporary coating (e.g., a non-film forming coating) may be produced, for example, by selection of a phenolic resin that comprises fewer or no crosslinkable moieties, selection of an addition binder that comprises fewer or no crosslinkable moieties, reducing the concentration of the ~~a~~ phenolic resin and/or additional binder, using a bake cured a phenolic resin coating at temperatures less than is needed for curing (e.g., ambient conditions), or a combination thereof.

Please replace paragraph [0394] with the following rewritten paragraph.

[0394] In other aspects, wherein a film is desired, ~~it~~ a novolak coating may be used. However, a novolak resin is generally a non-film forming resin. It is particularly preferred that the coating comprise an epoxy resin. It is also preferred that the coating comprise a basic catalyst. A film produced from such a novolak-epoxy coating typically possesses good resistance to chemicals,

water, heat, or a combination thereof. In specific facets, a novolak-epoxy coating may be a high solids coating, a powder coating, a pipeline coating, or a combination thereof.

Please replace paragraph [0408] with the following rewritten paragraph.

[0408] In alternative embodiments, an acrylic resin temporary coating (e.g. a non-film forming coating) may be produced, for example, by selection of an acrylic resin that comprises fewer or no crosslinkable moieties, selection of an addition binder that comprises fewer or no crosslinkable moieties, reducing the concentration of the ~~an~~ acrylic resin and/or additional binder, using a bake cured ~~an~~ acrylic resin coating at temperatures less than is needed for curing (e.g., ambient conditions), selection of size range for a thermoplastic acrylic resin coating that is less suitable for film formation (e.g., 1 kDa to 75 kDa), selection of a thermoplastic acrylic resin with T_g that is lower than the temperature ranges herein and/or 20°C lower than the temperature range of use, or a combination thereof.

Please replace paragraph [0414] with the following rewritten paragraph.

[0414] An exterior latex coating typically produces a film with greater flexibility than an interior latex due to temperature changes and/or dimensional movement of a substrate (e.g., wood). In certain embodiments, the acrylic resin has a T_g to 10°C to 35°C, including all intermediate ranges and combinations thereof. The selection of a T_g may be influenced by the selection of the amount of particulate material (e.g., pigment) in the coating to achieve a particular visual appearance. For example, a higher pigment volume content ("PVC") that is typically selected to reduce gloss. However, to retain properties such as flexibility, a binder with a lower T_g may be selected for combination with the higher PVC. For example, a flat exterior latex ~~a~~ coating generally possesses a pigment volume content of 40% to 60% and a T_g of 10°C to 15°C, including all intermediate ranges and combinations thereof, respectively. In another example, a semigloss or gloss exterior latex binder of a coating generally possesses a T_g of 20°C to 35°C, including all intermediate ranges and combinations thereof, respectively. In other embodiments, the exterior latex binder particle size is selected to be relatively small such as 90 nm to 110 nm, including all intermediate ranges and combinations thereof. In certain facets, a smaller latex

particle size promotes adhesion of the coating and/or film, particularly to a surface that comprises a degraded (*e.g.*, chalking) film. In certain other embodiments, a larger latex particle size may be selected to increase the coating and/or film's build (*e.g.*, thickness). In certain aspects, a larger latex particle size ranges from, for example 325 nm to 375 nm, including all intermediate ranges and combinations thereof.

Please replace the paragraph [0421] with the following rewritten paragraph.

[0421] In other embodiments, a thermosetting acrylic resin may be combined with an amino resin. In general embodiments, an acrylic resin comprising an acid (*e.g.*, carboxyl) moiety, a hydroxyl moiety, or a combination thereof, may be selected for cross-linking with an amino resin. An acrylic amino coating, wherein the acrylic resin comprises an acid moiety, may be cured by baking at, for example 150°C for 30 minutes. However, an acid moiety acrylic amino coating is typically undergoes a greater degree of reactions between amino resins, which reduces properties such as toughness. In specific aspects, an acrylic resin comprises a monomer that comprises a hydroxyl moiety such as a hydroxyethyl acrylate (“HEA”), a hydroxyethyl methacrylate (“HEMA”), or a combination thereof. An acrylic amino coating, wherein the acrylic resin comprises a hydroxyl moiety, typically comprises an acid catalyst to promote curing by baking at, for example 125°C for 30 minutes. An acrylic amino coating, wherein the amino resin was prepared from urea, generally produces a film with lower gloss, less chemical resistance, or a combination thereof, than an amino resin prepared from another nitrogen compound. Selection of a melamine and/or benzoguanamine based amino coating generally produces a film with excellent weathering resistance, excellent solvent resistance, good hardness, good mar resistance, or a combination thereof, and such an acrylic amino coating may be selected for an automotive topcoat.

Please replace paragraph [0422] with the following rewritten paragraph.

[0422] In other embodiments, a thermosetting acrylic resin may be combined with an ~~an~~ a urethane resin. In general embodiments, an acrylic resin comprising an acid moiety, a hydroxyl moiety, or a combination thereof, may be selected for crosslinking with an ~~an~~ a urethane resin. In specific

embodiments, an acrylic resin comprises a hydroxyl moiety, such as, for example, a moiety provided by a HEA monomer, a HEMA monomer, or a combination thereof. Selection of an aliphatic isocyanate urethane (*e.g.*, hexamethylene diisocyanate based) generally produces a film with superior color, weathering, or a combination thereof relative to other urethanes. An acrylic urethane coating may comprise a catalyst, such as, for example, triethylene diamine, zinc naphthenate, dibutyl tin-di-laurate, or a combination thereof. An acrylic urethane coating cures at ambient conditions. However, an acrylic urethane coating typically is a two-pack coating to separate the reactive binders until application. An acrylic urethane coating generally produces a film with good weathering, good hardness, good toughness, good chemical resistance, or a combination thereof. An acrylic urethane coating may be selected for an aircraft coating, an automotive coating, an industrial coating (*e.g.*, an industrial maintenance coating), or a combination thereof.

Please replace paragraph [0429] with the following rewritten paragraph.

[0429] A polyvinyl resin of 60 kDa to 110 kDa, including all intermediate ranges and combinations thereof, may be selected for use as an organosol or a plastisol. A plastisol is a coating comprising a vinyl homopolymer binder and a liquid component, wherein the liquid component comprises a plasticizer comprising a minimum of 55 parts or more of plasticizer per hundred parts of homopolymer binder in the coating. In certain embodiments, a plastisol comprises, by weight, 0% to 10% including all intermediate ranges and combinations thereof, of a thinner (*e.g.*, an aliphatic hydrocarbon). A plastisol coating typically comprises an additional vinyl binder. A plastisol may comprise a pigment, however, a low oil absorption pigment is preferred to avoid undesirable increase in coating viscosity given the liquid component used for a plastisol.

Please replace paragraph [0430] with the following rewritten paragraph.

[0430] An organosol is similar to a plastisol, except the less than 55 parts of plasticizer per hundred parts of homopolymer binder is used in the coating. In typical embodiments, the liquid component of an organosol comprises a weak solvent that may act as a dispersant and a thinner (*e.g.*, a

hydrocarbon). In typical aspects, the reduced content of plasticizer produced a film with a superior hardness property relative to a plastisol. In additional embodiments, the nonvolatile component of an organosol is 50% to 55%, including all intermediate ranges and combinations thereof. An organosol coating typically comprises a second binder. In specific aspects, the second binder is a vinyl copolymer, an acrylic, or a combination thereof. In certain aspects, the second binder comprises a carboxyl moiety, a hydroxyl moiety, or a combination thereof. In further aspects, an organosol may comprise a third binder. In specific facets, the third binder comprises an amino resin, a phenolic resin prepared from formaldehyde, or a combination thereof. In additional facets, a second binder that comprises a hydroxyl moiety may undergo a thermosetting cross-linking reaction with a third binder. An organosol may comprise a pigment suitable for general polyvinyl coatings.

Please replace paragraph [0435] with the following rewritten paragraph.

[0435] In certain embodiments, a coating may comprise a rubber resin as a binder. A rubber may be either obtained from a biological source ("natural rubber"), synthesized from petroleum ("synthetic rubber"), or a combination thereof. Examples of synthetic rubber include polymers of styrene monomers, butadiene monomers, or a combination thereof. In alternative embodiments, a rubber temporary coating (e.g., a non-film forming coating) may be produced, for example, by selection of rubber resin that that comprises fewer or no crosslinkable moieties, selection of an addition binder that comprises fewer or no crosslinkable moieties, reducing the concentration of the ~~a~~-rubber resin and/or additional binder, or a combination thereof.

Please replace paragraph [0440] with the following rewritten paragraph.

[0440] In further embodiments, a bituminous coating may be selected as a roof coating. Typically, a bituminous roof coating comprises an extender, a thixotrope, or a combination thereof. Examples of a thixotrope additive include asbestos, a silicon extender, a cellulosic, a glass fiber, or a combination thereof. In some aspects, a bituminous roof coating comprises a solvent-borne coating or a water-borne coating. Examples of solvents that may be selected include a mineral spirit, an aliphatic hydrocarbon (e.g., a naphtha, a mineral spirit), an aromatic solvent (e.g., xylene, toluene) or a

combination thereof. A bituminous roof coating may be selected as a primer, a topcoat, or a combination thereof. A bituminous roof topcoat typically further comprises a metallic pigment.

Please replace paragraph [0446] with the following rewritten paragraph.

[0446] In general embodiments, a silicone coating is a thermosetting coating. Often, a silicon coating is a multi-pack coating due to a limited pot life ~~one-when~~ the coating components are admixed. The crosslinking reaction depends upon the binder's specific silicon moiety. A plurality of binders may be used, each comprising one or more crosslinking moieties. A binder comprising crosslinking SiOH and HOSi moieties generally comprises a cure agent such as a lead octoate, a zinc octoate, or a combination thereof. In general aspects, the thermosetting SiOH and HOSi silicon coating is bake cured (*e.g.*, 250°C for one hour). A binder comprising crosslinking SiOH and HSi moieties typically comprises a tin catalyst. A binder comprising crosslinking SiOH and ROSi moieties, wherein RO is an alkoxy moiety, also typically comprises a tin catalyst. A coating prepared using SiOH and ROSi silicon binder typically further comprises an iron oxide, a glass microballon, or a combination thereof to improve heat resistance. This type of silicon may be selected for rocket and jet engine parts. A binder comprising crosslinking SiOH and CH₃COOSi moieties is moisture cured, and typically comprises a tin catalyst (*e.g.*, an organotin compound). A binder comprising crosslinking SiOH and R₂NOSi moieties, wherein R₂NO is an oxime moiety, is also moisture cured, and typically comprises a tin catalyst. The moisture cured silicon coatings may be selected for one-pack silicon coatings, though film formation is generally slower than other types of silicon thermosetting coatings. A binder comprising crosslinking SiCH=CH₂ and R₂NOSi moieties, wherein R₂NO is an oxime moiety, typically comprises a platinum catalyst, and may be bake cured. A film produced by a SiCH=CH₂ and R₂NOSi silicon coating possesses excellent toughness, flame resistance, or a combination thereof. Such a coating may be selected for a rocket part. However, coating components such as a rubber, a tin compound (*e.g.*, an organotin), or a combination thereof, may inhibit platinum catalyzed film formation in this silicon coating.

Please replace paragraph [0449] with the following rewritten paragraph.

[0449] In alternative embodiments, a silicon temporary coating (e.g., a non-film forming coating) may be produced, for example, by selection of an addition binder that comprises fewer or no crosslinkable moieties, reducing the concentration of the ~~a~~-silicon resin and/or additional binder, using a bake-cured silicon coating at non-baking conditions, inclusion of a rubber, a tin compound (e.g., an organotin), or a combination thereof.

Please replace paragraph [0464] with the following rewritten paragraph.

[0464] However, due to exceptions to the ability of certain liquid components and potential solute coating components to form solutions, empirically determining the ability of a solute to dissolve in a solvent may be desirable in certain embodiments. Standard techniques for determining the ability of a liquid component comprising one or more liquids to function as an active solvent, a latent solvent, a diluent, or a combination thereof, relative to one or more potential solutes are known to those of ordinary skill in the art. For example, the solvency of a liquid component comprising an active solvent (e.g., an oxygenated compound), a latent solvent, a diluent (e.g., a hydrocarbon), or a combination thereof, particularly for use in a lacquer coating, may be determined as described in "ASTM Book of Standards, Volume 06.04, Paint -- Solvents; Aromatic Hydrocarbons," D1720-96, 2002). In an additional example, the solvency for a liquid component that primarily comprises a hydrocarbon, and comprises little or lacks an oxygenated compound, may be determined as described in "ASTM Book of Standards, Volume 06.04, Paint -- Solvents; Aromatic Hydrocarbons," D1133-02, 2002). In a further example, the solvency of a solution comprising a liquid component and an additional coating component (e.g., a binder) may be ~~used to~~ determined, as described in "ASTM Book of Standards, Volume 06.03, Paint -- Pigments, Drying Oils, Polymers, Resins, Naval Stores, Cellulosic Esters, and Ink Vehicles," D1545-98, D1725-62, D5661-95, D5180-93, D6038-96, D5165-93, and D5166-97, 2002. In a supplemental example, the dilutability of a solution comprising a liquid component (e.g., a solvent and diluent) and an additional coating component (e.g., a binder) may be ~~used to~~ determined, as described in "ASTM Book of Standards, Volume 06.03, Paint -- Pigments,

Please replace paragraph [0466] with the following rewritten paragraph.

[0466] Though it is contemplated that most or all liquid ~~component-components~~ will be lost from a coating composition during film formation, a liquid component may still contribute to the visual properties of a coating and/or film. In embodiments wherein a liquid component is selected as a colorizing agent, the color and/or darkness of the liquid may be empirically measured (see, for example, “ASTM Book of Standards, Volume 06.04, Paint -- Solvents; Aromatic Hydrocarbons,” D1209-00, D1686-96, and D5386-93b, 2002); and “ASTM Book of Standards, Volume 06.01, Paint -- Tests for Chemical, Physical, and Optical Properties; Appearance,” D1544-98, 2002. In some embodiments, a liquid component and/or coating may be selected on the basis of odor (*e.g.*, faint odor, pleasant odor, *etc.*). A coating or coating component can be evaluated for suitability in a particular application based on odor using, for example, techniques described in “ASTM Book of Standards, Volume 06.04, Paint -- Solvents; Aromatic Hydrocarbons,” D1296-01, 2002; and “ASTM Book of Standards, Volume 06.01, Paint -- Tests for Chemical, Physical, and Optical Properties; Appearance,” D6165-97, 2002.

Please replace paragraph [0476] with the following rewritten paragraph.

[0476] A ketone comprises a ketone moiety. However, a preferred ketone comprises a single ketone moiety. A ketone generally possesses some miscibility with water, and a strong odor. In general embodiments, a ketone may be selected as a primary solvent, thinner, or combination thereof. Examples of a ketone include acetone (CAS No. 67-64-1); methyl ethyl ketone (CAS No. 78-93-3); methyl propyl ketone (CAS No. 107-87-9); methyl isopropyl ketone (CAS No. 563-80-4); methyl butyl ketone (CAS No. 591-78-6); methyl isobutyl ketone (CAS No. 108-10-1); methyl amyl ketone (CAS No. 110-43-0); methyl isoamyl ketone (CAS No. 110-12-3); diethyl ketone (CAS No. 96-22-0); ethyl amyl ketone (CAS No. 541-85-5); dipropyl ketone (CAS No. 110-43-0); diisopropyl ketone (CAS No. 565-80-0); cyclohexanone (CAS No. 108-94-1); methylcyclohexanone (CAS No. 1331-22-2); trimethylcyclohexanone (CAS No. 873-94-9);

mesityl oxide (CAS No. 141-79-7); diisobutyl ketone (CAS No. 108-83-8); isophorone (CAS No. 78-59-1); or a combination thereof. Acetone may be selected for complete miscibility in water, fast evaporation, or a combination thereof. In certain embodiments, acetone may be used as a liquid component in an aerosol, a ~~spayspray~~-applied coating, or a combination thereof. In specific aspects, acetone may be used as a thinner. In other aspects, acetone may be used in a coating wherein nitrocellulose, an acrylic, or a combination thereof, is dissolved. Methyl ethyl ketone, methyl isobutyl ketone, and isophorone may be selected in embodiments wherein a fast evaporation rate, moderate evaporation rate, or slow evaporation rate, respectively, is desired. In specific facets, isophorone may be selected for a baked coating, an industrial coating, or a combination thereof. Examples of an azeotrope comprising a ketone include an azeotrope comprising acetone, methyl ethyl ketone or methyl isobutyl ketone. Examples of an azeotrope comprising a majority of acetone (BP 56.2°C) include those comprising 12% methanol (A-BP 55.7°C); or 41% hexane (A-BP 49.8°C). Examples of an azeotrope comprising a majority of methyl ethyl ketone (BP 79.6°C) include those comprising 11% water (A-BP 73.5°C); 32% isopropyl alcohol (A-BP 77.5°C); or 34% ethanol (A-BP 74.8°C). Examples of an azeotrope comprising a majority of methyl isobutyl ketone (BP 114°C to 117°C) include those comprising 24.3% water (A-BP 87.9°C); or 30% butanol (A-BP 114.35°C).

Please replace paragraph [0523] with the following rewritten paragraph.

[0523] A copper phthalocyanine (CI Pigment Blue 15, CI Pigment Blue 15:1, CI Pigment Blue 15:2, CI Pigment Blue 15:3, CI Pigment Blue 15:4, CI Pigment Blue 15:6, CI Pigment Blue 16) may be selected for embodiments wherein good color strength, good tinctorial strength, good heat stability, good lightfastness, good solvent resistance, transparency, or a combination thereof, is suitable. CI Pigment Blue 15 is redish in hue, but is chemically unstable upon contact with an aromatic hydrocarbon, and converts to a greenish blue compound. CI Pigment Blue 15:1 is a form of CI Pigment Blue 15 chemically stabilized by chlorination, greener, and tinctorially weaker than CI Pigment Blue 15. CI Pigment Blue 15:2 is a modified form of CI Pigment Blue 15 that is resistant to flocculation. CI Pigment Blue 15:3 is greenish-blue, while CI Pigment Blue 15:4 is a modified form of CI Pigment Blue 15:3 that is resistant to flocculation. CI Pigment Blue 16 is relatively transparent. Examples of coatings wherein copper phthalocyanine

are ~~is~~ used include a metallic automotive coating. However, as described above, a copper phthalocyanine may be susceptible to flocculation due to small primary particle size, and various modified forms are known wherein flocculation is reduced. Examples of modifications used to reduce flocculation adding a sulfonic acid moiety; a sulfonic acid moiety and a long chain amine moiety; an aluminum benzoate; an acidic binder (e.g., a rosin); a chloromethyl moiety; or a combination thereof, to the phthalocyanine. A modified phthalocyanine may be selected for embodiments wherein superior color shade, dispersibility, gloss, or a combination thereof is suitable.

Please replace paragraph [0574] with the following rewritten paragraph.

[0574] A coating may comprise a preservative to reduce or prevent the deterioration of a coating and/or film by a microorganism. As would be known to one of ordinary skill in the art, a microorganism is generally considered a contaminant capable damaging a film and/or coating to the point of suitable usefulness in a given embodiment. A surprising and unexpected aspect of the present invention is the discovery of the suitability of a microorganism based particulate material of the present invention for use as a purposefully added coating component. However, it is preferred that a coating comprising a microorganism based particulate material of the present invention also comprises a preservative. It is contemplated that continued growth of a microorganism from the microorganism base particulate material of the present invention would be detrimental to a coating and/or film, and a preservative may reduce or prevent such growth. It is further contemplated that a contaminating microorganism could use the microorganism based particulate material of the present invention as a readily available source of nutrients for growth, and a preservative may reduce or prevent such growth. It is also contemplated that the amount of preservative added to a coating comprising a microorganism based particulate material of the present invention may be increased relative to a preservative content of a similar coating lacking such an added microorganism based particulate material. In certain aspects, it is contemplated that the amount of preservative may be increased 1.1 to 10-fold or more, including all intermediate ranges and combinations thereof, the amount of an example of a preservative content described herein or as would be known to one of ordinary skill in the art in light of the present disclosures.

Please replace paragraph [0596] with the following rewritten paragraph.

[0596] A rheology modifier that alters viscosity (*e.g.*, increases, decreases, maintains) is known as a “viscosifier.” During application, a coating is usually subjected to a shear force 10^3 s^{-1} to 10^4 s^{-1} by techniques such as brush application, and a shear force up to or greater than 10^6 s^{-1} by techniques including, for example, blade application, high-speed roller application, spray application, or a combination thereof. As would be known to one of ordinary skill in the art, a coating typically is formulated to possess a viscosity upon the shear force of application that promotes the ease of application. An example of a coating viscosity during application is between 0.5 P (“50 mPa s”) to 2.5 P (“250 mPa s”), including all intermediate ranges and combinations thereof. In certain aspects, a coating may possess a viscosity greater or lower than this range, however, it is contemplated such a viscosity may make the coating more difficult to apply using the above application techniques. Post-preparation and/or post-application, a coating is usually subjected to a shear force of 10 s^{-1} to 10^3 s^{-1} produced, for example, by forces such as gravity, capillary pressure, or a combination thereof. In embodiments wherein a coating’s viscosity is too high at these levels of shear force, leveling during and/or after application may be undesirably low. In embodiments wherein a viscosity is ~~to~~ too low at these levels of shear force, a coating may suffer in-can settling, sagging during or after application, or a combination thereof. A preferred viscosity of a coating post-preparation and/or application is between 100 P (“10 Pa s”) to 1000 P (“100 Pa s”), the including all intermediate ranges and combinations thereof. Of course, the viscosity of a coating will change post-application in embodiments wherein film formation occurs; however, the post-application viscosity refers to the viscosity prior to completion of film formation, and may be determined immediately post-application (*e.g.*, within seconds, within minutes) as appropriate to the coating, as would be known to one of ordinary skill in the art. In certain aspects, a coating may possess a viscosity greater or lower than this range, however, it is contemplated such a viscosity may make the coating more prone to sagging and/or settling defects.

Please replace paragraph [0598] with the following rewritten paragraph.

[0598] As would be known to one of ordinary skill in the art, the addition of a coating component to a coating composition typically alters a rheological property, and many coating components have multiple classifications to include function as a rheology modifier. Examples of coating components more commonly added for function as a rheology modifier ~~includes~~ include an inorganic rheology modifier, an organometallic rheology modifier, an organic rheology modifier, or a combination thereof. An example of an inorganic rheology modifier includes a silicate such as a montmorillonite silicate. An example of a montmorillonite silicate includes aluminum silicate, a bentonite, magnesium silicate, or a combination thereof. A silicate rheology modifier typically confers a superior washfastness property, a superior abrasion resistance property, or a combination thereof, to a coating relative to an organic rheology modifier. An example of an organic rheology modifier includes a cellulose ether, a hydrogenated oil, a polyacrylate, a polyvinylpyrrolidone, a urethane, or a combination thereof. Organic rheology modifiers of a polymeric nature (*e.g.*, a cellulose ether, a urethane, a polyacrylate, *etc.*) are sometimes used as an associative thickener, and are preferred for a latex coating. An organic rheology modifier typically confers a greater water retention capacity property ("open time") to a coating relative to a silicate rheology modifier. A common example of a cellulose ether is a methyl cellulose, a hydroxyethyl cellulose, or a combination thereof. An example of a hydroxyethyl cellulose includes Natrosol® (Hercules Incorporated); Cellosize™ (Dow Chemical Company); or a combination thereof. An example of hydrogenated oil includes hydrogenated castor oil. An example of a urethane rheology modifier ("associative thickener") includes a hydrophobically modified ethylene oxide urethane ("HEUR"), which comprises a polyethylene glycol block covalently linked by urethane, and has both a hydrophilic and hydrophobic regions capable of use in an aqueous environment. An example of a HEUR includes a block of polyethylene oxide linked by an urethane and modified with a nonyl phenol hydrophobe (Rohm and Haas Company). Often a urethane rheology modifier confers a superior leveling property over another type of organic rheology modifier. An example of an organometallic rheology modifier includes a titanium chelate, a zirconium chelate, or a combination thereof.

Please replace paragraph [0600] with the following rewritten paragraph.

[0600] A coating sometimes comprises a gas capable of forming a bubble (“foam”) that can undesirably alter a physical and/or aesthetic property. Undesirable gas incorporation into a coating composition is often a side ~~effect-effect~~ of coating preparation processes, and a particular bane of latex coatings. Often, a wetting agent and/or a dispersant used in a coating may promote creation or retention of foam. Additionally, microorganisms can produce gas, and in certain embodiments, a coating comprising a microorganism based particulate material of the present invention may also comprise a defoamer. A defoamer (“antifoaming agent,” “antifoaming additive”) is a composition that releases gas (e.g., air) and/or reduces foaming in a coating during production, application, film formation, or a combination thereof. A defoamer often acts by lowering the surface tension around a bubble, allowing merging of a bubble with a second bubble, which produces a larger and less stable bubble that collapses.

Please replace paragraph [0603] with the following rewritten paragraph.

[0603] A drier (“siccative”) catalyzes an oxidative film formation reaction, such as those that occur in an oil-based coating. In addition to the disclosures herein, an drier and use of ~~an a~~ drier in a coating is known to those of skill in the art, and such materials and techniques for using ~~an a~~ drier in a coating may be applied in the practice of the present invention (see, for example, Flick, E. W. “Handbook of Paint Raw Materials, Second Edition,” pp. 73-93 and 879-998, 1989; in “Paint and Coating Testing Manual, Fourteenth Edition of the Gardner-Sward Handbook,” (Koleske, J. V. Ed.), pp 30-35, 1995; in “Paint and Surface Coatings, Theory and Practice, Second Edition,” (Lambourne, R. and Strivens, T. A., Eds.), pp. 190-192, 1999; Wicks, Jr., Z. W., Jones, F. N., Pappas, S. P. “Organic Coatings, Science and Technology, Volume 1: Film Formation, Components, and Appearance,” pp. 138, 317-318, 1992; Wicks, Jr., Z. W., Jones, F. N., Pappas, S. P. “Organic Coatings, Science and Technology, Volume 2: Applications, Properties and Performance” pp. 138, 197-198, 330, 344, 1992; and in “Paints, Coatings and Solvents, Second, Completely Revised Edition,” (Stoye, D. and Freitag, W., Eds.) pp. 11, 48, 165, 1998.

Please replace paragraph [0626] with the following rewritten paragraph.

[0626] For example, during typical preparation of a water-borne and/or solvent-borne coating comprising particulate material such as a pigment and/or extender, the particulate material is dispersed into a paste known as a “grind” or “millbase.” A combination of a binder and a liquid component known as a “vehicle” is used to disperse the particulate material into the grind. Often, a wetting additive is included to ~~promoted~~ ~~promote~~ dispersion of the particulate material. Additional vehicle and/or additives are admixed with the grind in a stage ~~referred~~ referred to as the “letdown” to produce a coating of a desired composition and/or properties. These techniques and others for coating preparation are well known to those of ordinary skill in the art [see, for example, in “ASTM Book of Standards, Volume 06.01, Paint -- Tests for Chemical, Physical, and Optical Properties; Appearance,” D6619-00, 2002; in “Paint and Surface Coatings, Theory and Practice, Second Edition,” (Lambourne, R. and Strivens, T. A., Eds.), pp. 286-329, 1999; and in “Paints, Coatings and Solvents, Second, Completely Revised Edition,” (Stoye, D. and Freitag, W., Eds.) pp. 178-193, 1998.] It is specifically contemplated that these techniques may be used in preparing a coating comprising the microorganism based particulate matter of the present invention, wherein the particulate matter of the present invention is treated as a pigment, extender, or other such particulate material dispersed into a coating.

Please replace paragraph [0633] with the following rewritten paragraph.

[0633] It is contemplated that in general embodiments, a coating comprising a microorganism derived particulate material of the present invention may be subjected to one or more of such assays. Additionally, a microorganism derived particulate material may further comprise a desired biomolecule (*e.g.*, a colorant, an enzyme), whether endogenously or recombinantly produced, that may confer a desired property to a coating and/or film of the present invention. As used herein, “bioactivity” refers to desired property such as color, enzymatic activity, *etc.*, conferred to a coating by a biomolecule of a microorganism derived particulate material of the present invention. As used herein, “bioactivity resistance” refers to the ability of a biomolecule to confer a desired property during and/or after contact with a stress condition normally assayed for in a standard coating and/or film assay procedure. Examples of such a stress condition

includes, for example, a temperature (*e.g.*, a baking condition), contact with a coating component (*e.g.*, an organic liquid component), contact with a chemical reaction (*e.g.*, thermosetting film formation), contact with coating and/or film damaging agent (*e.g.*, weathering, detergents, solvents), etc. In specific facets, wherein a microorganism derived particulate material of the present invention ~~that~~ comprises a desired biomolecule, a biomolecule may possess a greater bioactivity resistance such as ~~as~~ determined with standard assay procedure, than a purified or partly purified-like biomolecule.

Please replace paragraph [0635] with the following rewritten paragraph.

[0635] In an additional example, any assay described herein or would be known to one of ordinary skill in the art in light of the present disclosures may be used to determine the bioactivity resistance wherein an enzyme retains detectable enzymatic activity upon contact with a condition typically ~~encounter~~ encountered in a standard assay. Additionally, in certain aspects, it is contemplated that a coating and/or film comprising an enzyme may lose part of all of a detectable, desirable bioactivity during the period of time of contact with standard assay condition, but regain part or all of the enzymatic bioactivity after return to non-assay conditions. An example of this process is the thermal denaturation of an enzyme at an elevated temperature range into a configuration with lowered or absent bioactivity, followed by refolding of an enzyme, upon return to a preferred temperature range for the enzyme, into a configuration possessing part or all of the enzymatic bioactivity detectable prior to contact with the elevated temperature. In another example, an enzyme may demonstrate such an increase in bioactivity upon removal of a solvent, chemical, *etc.*

Please replace paragraph [0688] with the following rewritten paragraph.

[0688] It is contemplated that for each formulation of a coating and a biomolecular composition of the present invention, enzymatic decontamination parameters based on chemical (*e.g.*, CWA simulant) degradation assessment will be established in a range of exterior weathering conditions. If a specific formulation of enzyme composition in a coating remains active after exposure to exterior weathering conditions, there is a significant utility for using the bioactive painted surfaces in exterior and field application. For example, it is contemplated that a biomolecular composition of the present

invention incorporated in standard formulations of water-based or latex-based paint will result in minimal to no changes in the durability of the paint based on standard exterior weathering conditions. In a general aspect of the present invention, a weathering study may indicate a need to reformulate a composition to improve a particular property (e.g., enhance biomolecular composition stability). In this aspect, it is contemplated that standard methods, known to those of skill in the art (e.g., encapsulation), may be used to increase stability and re-test the resulting formulation. Application of such methods can be used to modify various formulations to produce a composition with one or more properties optimized to a particular application, as described herein and as would be ~~known~~ known to one of ordinary skill in the art in light of the present disclosures.

Please replace paragraph [0701] with the following rewritten paragraph.

[0701] Batch Culture-400 L scale was grown at the following conditions: 30°C; 150-200 rpm agitation; DO at 0-100%; uncontrolled initial pH 6.58; 200-300 Lpm (0.5-0.75 vvm) aeration; and tank pressure at 0-10 psi. Over a time period of 0 to 30 hours, the *Escherichia coli* strain's growth was measured by optical density at 600 nm, the specific paraoxonase activity was determined ($\mu\text{mol ml}^{-1} \text{ min}^{-1}$), the volumetric paraoxonase activity was determined ($\mu\text{mol ml}^{-1} \text{ min}^{-1}$), the pH measured over a range of pH 6 to pH 8, the agitation measured over a range of 0 rpm to 200 rpm, the dissolved oxygen measured over a range of 0% to 100%, the aeration rate measured over a range of 0 to 300 Lpm, and the ~~tank~~ tank pressure measured over a range of 0 psi to 12 psi.

Please replace paragraph [0706] with the following rewritten paragraph.

[0706] Alternatively, it is contemplated that a previously described coating composition may be altered by substitution ("replacement") of one or more coating components, particularly a binder and/or a particulate material coating component (e.g., a pigment, a rheological control agent, a dispersant) by the biomolecular composition of the present invention. It is contemplated that 0.001% to 100%, including all intermediate ranges and combinations thereof, of the binder and/or particulate material coating component may be substituted by biomolecular composition of the present invention. Additionally, the concentration of a biomolecular composition of the present invention may exceed 100%, by weight or volume, of the substituted coating component.

In specific aspects, a coating component may be substituted with a biomolecular composition of the present invention equivalent to 0.001% to 500%, including all intermediate ranges and combinations thereof, of the coating component. For example, a 20% (*e.g.*, 2 kg) of a dispersant may be replaced by 10% (*e.g.*, 1 kg) of the biomolecular composition of the present invention to produce a coating with similar dispersion properties as a non-substituted formulation. In an ~~addition~~additional example, 70% of a specific pigment (*e.g.*, 7 kg) may be replaced by the equivalent of 127% (*e.g.*, 12.7 kg) of the biomolecular composition of the present invention to produce a coating with similar hiding power as a non-substituted formulation. The various assays described herein, or as would be known to one of ordinary skill in the art in light of the present disclosures, may be used to determine the properties of a coating and/or film produced by direct addition and/or coating component substitution by the biomolecular composition of the present invention.

Please replace paragraph [0718] with the following rewritten paragraph.

[0718] ~~It~~In an additional embodiment is it contemplated that the following organisms produce an OPAA that may be used in a biomolecular composition of the present invention: *Acinetobacter calcoaceticus* ATCC 19606, *Aeromonas hydrophila* ATCC 7966, *Aeromonas proteolytica*, Arm. A isolate 1, Arm. A isolate 2, *Bacillus subtilis* (fr. Zuberer), *Bacillus subtilis*, ATCC 18685, *Bacillus subtilis* BRB41, *Bacillus subtilis* Q, *Bacillus thuringiensis* (fr. Zuberer), *Burkholderia cepacia* LB400, *Burkholderia cepacia* T, *Citrobacter diversus*, *Citrobacter freundii* ATCC 8090, *Edwardsiella tarda* ATCC 15947, *Enterobacter aerogenes* ATCC 13048, *Enterobacter cloacae* 96-3, *Enterobacter liquefaciens* 363, *Enterobacter liquefaciens* 670, *Erwinia carotovora* EC189-67, *Erwinia herbicola*, *Erwinia herbicola* (agglomerans), *Escherichia coli* E63, *Hafnia alvei* ATCC 13337, *Klebsiella pneumoniae* ATCC 13883, *Lactobacillus casei* 686, *Lactococcus lactis* subsp. *lactis* pIL253, *Proteus morganii*, *Proteus vulgaris* ATCC 13315, *Pseudomonas aeruginosa* ATCC 10145, *Pseudomonas aeruginosa* ATCC 27853, *Pseudomonas fluorescens*, *Pseudomonas putida* ATCC 18633, *Pseudomonas putida* PpY101, *Pseudomonas* sp. P, *Salmonella typhimurium* ATCC 14028, *Serratia marcescens* ATCC 8100, *Serratia marcescens* HY, *Serratia marcescens* Nima, *Shigella flexneri* ATCC 12022, *Shigella sonnei* ATCC 25931, *Staphylococcus aureus* ATCC 25923, *Staphylococcus* sp. S, *Streptococcus faecalis* ATCC

19433, *Vibrio parahaemolyticus* TAMU 109, *Yersinia enterocolitica* ATCC 9610, *Yersinia enterocolitica* TAMU 84, *Yersinia frederiksenii* TAMU 91, *Yersinia intermedia* ATCC 29909, *Yersinia intermedii* TAMU 86, *Yersinia kristensenii* ATCC 33640, *Yersinia kristensenii* TAMU 95, *Yersinia* sp. ATCC 29912, *Vibrio proteolyticus* ATCC 15338, *Thermus* sp. ATCC 31674, *Streptomyces cinnamonensis* subsp. *Proteolyticus* ATCC 19893, *Deinococcus proteolyticus* ATCC 35074, *Clostridium proteolyticum* ATCC 49002, *Aeromonas jandaei* ATCC 49568, *Aeromonas veronii* biogroup *sobria* ATCC 9071, *Pseudoalteromonas haloplanktis* ATCC 23821, *Xanthomonas campestris* ATCC 33913, *Pseudoalteromonas espejiana* ATCC 27025, *Shewanella putrefaciens* ATCC 8071, *Stenotrophomonas maltophilus* ATCC 13637, *Ochrobactrum anthropi* ATCC 19286, *Desulfovibrio vulgaris*, or a combination thereof.

Please replace paragraph [0721] with the following rewritten paragraph.

[0721] Alternatively, in a 3 ml cuvette, add: paraoxon to 1 mM (ex: 168 μ l of 12 mM paraoxon), and assay buffer to 2.0 ml (ex: 1832 μ l CHES buffer). Add a 5 (or 15 mm) length of treated stick to start the reaction. Record the (A_{400nm}) at the following time points: 0, 15, 30, 45, 60, 120, 180, 240, 300, 360, 420 and 480 minutes. Mix by inversion at regular intervals. [[—]]If ~~absorbances~~absorbencies above 2.5 are observed, dilute 10 μ L samples with 90 μ L CHES buffer in a 100 μ L cuvette, as for fast reactions, above.